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8 August 1963

MEMORANDUM FOR: Chairman, Technical Development Committee
THROUGH : Executive Secretary, TDC
SUBJECT : Staff Study - Microdensitometric Capability and Data Interpretation Study

1. PROBLEM:

Although initial photographic systems evaluation is now assigned to [REDACTED], this does not negate the responsibility of NPIC for evaluation of certain aspects of these systems, in addition, evaluation of proposed systems is frequently requested from this agency. These evaluations consist of appraisal of their value from a photo interpretation viewpoint for numerous types of film at different scales, from a variety of cameras. Other requirements for information for comparison of processing techniques is frequently levied and although the reports to the requesting agency are as thorough as time and equipment permit, the results of our research would be enhanced by submitting densitometric data with these reports. On numerous occasions densitometric data has been requested but could not be fulfilled due to a lack of equipment and availability of qualified personnel.

2. DISCUSSION:

In order that NPIC realize the capability of providing more comprehensive, accurate and timely data concerning systems evaluation, it is essential that trained personnel be available to provide microdensitometer data for these reports and that these personnel be capable of accurately interpreting and presenting these data. Ideally, an intensive training period of three months could be inaugurated but it is doubtful that any one person could be spared for that period of time. It is therefore proposed that a microdensitometer study program be undertaken to provide a text for instruction and reference for personnel engaged in microdensitometry. Enclosure 1 of this study is an enumeration of the "Objectives for a Microdensitometer Capability and Interpretation Study." The subject matter will not be discussed at this point; however, the resulting text will provide an instruction capability that will allow the use of any microdensitometer to its fullest extent insuring complete and accurate interpretation of all data.

A survey of those agencies that were considered foremost in the field of microdensitometry was made and proposals received from each. The following portion of this report is a discussion of each proposal and justification for the award of the contract.

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31 Summary of Proposals for a Microdensitometer Study

A. [REDACTED]

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The study is somewhat oriented around the [REDACTED] Microdensitometer. This may not be a problem due to the general microdensitometer circuitry and operation being quite similar for most of these instruments. In the writer's opinion, it would have been better to deal with the general concept of the science of microdensitometry. There is also a statement in this proposal indicating that NPIC is responsible for arranging access to competitive equipment which is an impossible request since the contracting agency is not to be involved whatsoever in this effort.

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The cost of the study is given as [REDACTED]. This seems to be well below all other proposals, although cost of transportation and \$20 per diem is not included. It would seem plausible that between \$1000 and \$1500 be added for this, and a possible \$1000 may be incurred for a change in burden and hourly rates. The contract will be completed six months after notification of award. A round figure of [REDACTED] may be determined for eventual cost but this is still far below all other proposals and the amount and thoroughness of coverage is thereby questioned.

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B. [REDACTED]

Both the [REDACTED] effort are quite similar. There remains the fact that the [REDACTED] is the manufacturer of the "Micro-Analyzer" and thus the study may be based primarily on this instrument. The study will be completed twelve months after the award of the contract and the cost will be [REDACTED]. This is the highest bid received and this proposal is rejected on this basis.

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C. National Bureau of Standards

The proposal submitted by this agency is concerned with the calibrating and evaluating of microdensitometers with specific emphasis placed on the former. Since this proposal does not in any way satisfy the overall study program it will not be considered as applicable to the immediate problem.

D. [REDACTED]

This program is thorough and appears to be the best of the four proposals received. Since this laboratory is not involved in the manufacture of any specific microdensitometer it is logical to assume that their presentation should be unbiased. Other projects (Air Force) involving microdensitometric procedures and studies have been undertaken in the past which further their knowledge in these techniques. It is felt that the [REDACTED] is the best prospect for an intensive and thorough study in this field. Their contract is estimated "in the order of [REDACTED] for a four-task or thorough program and a minimum program of [REDACTED]. The first is to be considered since it includes additional subject matter in which we are interested. A final report will be submitted ten (10) months after the contract is awarded.

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4. CONCLUSIONS:

Since all of the proposed contractees were provided with the same study format, any great deviation in the price submitted would indicate that one of two conditions exist:

- a. That previous research has resulted in accumulation of most of the subject matter requested in the study, or
- b. That the depth to which the subject matter is to be investigated varies greatly.

25X1A It is quite obvious that there has to be justification for the awarding of the contract to [REDACTED]. Primarily, [REDACTED] seems to be basing the study on their instrumentation which, although of excellent quality, does not encompass systems research and experimentation compiled by other companies interested in the same product and they [REDACTED] will avail themselves to these areas only by previous arrangement for which NPIC is totally responsible. This condition is entirely unsatisfactory, unless the study is to be considered as a product of limited research. If the proposed text is to include all of the latest concepts and procedures, it cannot be limited to only one company's research capability and still be considered the most current information available.

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25X1A [REDACTED] has presented a detailed and encompassing proposal which will result in a text that can be considered as fulfilling all the requirements for subject matter as listed in the "Objectives for a Microdensitometer Capability and Interpretation Study." Previous diversified experience obtained by [REDACTED] in their research into microdensitometry for the Air Force, the capability of their personnel and the quality of their equipment seem to provide the prerequisites for the compilation of a current and thorough microdensitometer study.

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5. RECOMMENDATIONS:

25X1A It is recommended that a contract for [REDACTED] be awarded to the [REDACTED]. This contract will be an [REDACTED] CPEF type to cover a period of ten (10) months from date of award.

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[REDACTED]
Development Branch, P&DS

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OBJECTIVES FOR A MICRODENSITOMETER
CAPABILITY AND INTERPRETATION STUDY

1. Introduction

It is required that an intensive study be made with a class one microdensitometer which will enable the operator to accurately interpret data from this instrument and also to facilitate use of the instrument to its maximum capability. Results of this study will be published in an instruction manual consisting of (a) readout data and its interpretation and (b) the theoretical concepts as a backup to readout data obtained. Information collected from this study will be used for indoctrination of individuals into the art of microdensitometry and should be stated as clearly and precisely as possible. Theoretical concepts will be included as an addendum to the manual. The purpose of the manual would be to realize an instruction capability which is current and reflects the most recent developments in microdensitometry.

2. Subject Requirements

- (a) Effect of lens resolution on the reliability of density readings.
- (b) Micron and submicron scanning capabilities in respect to grain size, grain clumping.
- (c) Relative sensitivity of microdensitometer considering scan aperture size, emulsion or film types, film travel and related readout media.
- (d) Relationship of specular and diffuse density readings with respect to scanning aperture, emulsion depth, film types, light sources, processing levels and film densities.
- (e) Possible mensuration capabilities determined as a result of the preceding items of study.
- (f) Since a definition of class one, class two, etc. instruments remains unresolved, specific information should be given to define each.
- (g) Correlation of systems should be made for existing class one instruments to present data incorporation of all the latest capabilities.
- (h) The effectiveness of including a visual scan on a cathode ray oscilloscope and portrayal of scanned area on a high resolution screen.

- (i) The feasibility of incorporating a photo micrograph to record any image being scanned.
- (j) Research into the possibility of using a laser unit as a light source, including such factors as decay rate, life of unit, auxiliary equipment needed and feasibility study.
- (k) Production of a standard density wedge for testing the readout accuracy of the microdensitometer. Consideration of such media as glass, gelatin or other suitable material should be discussed.

3. Miscellaneous Requirements

- (a) Progress reports should be submitted on a monthly basis. Included in this report should be the status of the study/expenditure to date on an overall percentage comparison and proposed study phases.
- (b) The completed manual will be in the following form:
 - 1. Index
 - 2. Introduction
 - 3. Approach
 - 4. Main body of report including photography, graphs and tables.
 - 5. Technical portion serving as backup to main body information.
 - 6. Summary
 - 7. Bibliography of reference material.
 - 8. Glossary of terms. The definitions of words used must present the exact meaning as used within this study. If more than one interpretation is presented in the study, each shall be defined in the glossary with reference numbers for clarification.
 - 9. Appendix